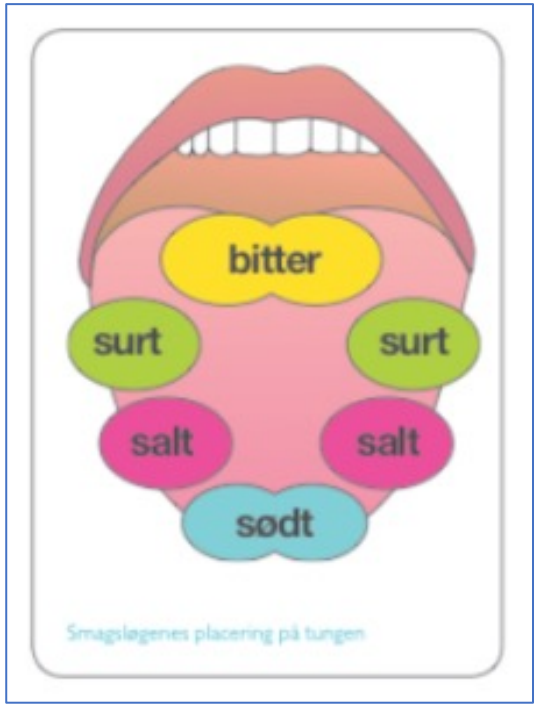

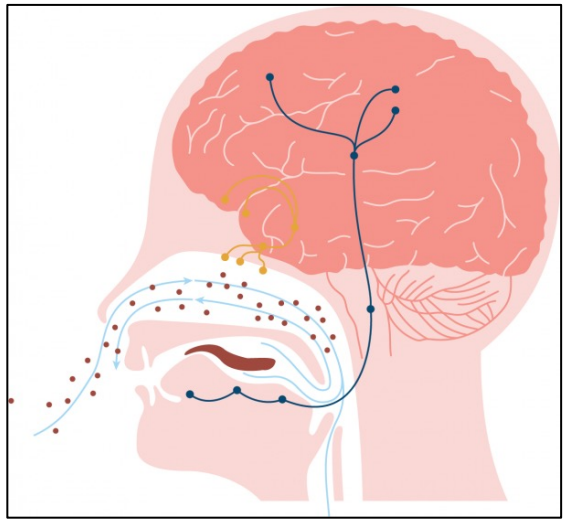

Hvad betyder druemodning og aromastoffer for valg af sorter til mousserende vin ?

Studiekredsserie nr. 4 i 2023-24 -
Studiekreds i Sensorik på Moussserende Vine

Carl-Henrik Brogren

Den 27. februar 2024, Mantziusgården, Birkerød

Hvordan kommer vi videre?

Den danske ”expert”:

- https://www.google.com/search?client=safari&rls=en&q=Youtube+Brut+de+m%C3%B8n+TV+M%C3%B8n&ie=UTF-8&oe=UTF-8#fpstate=ive&vld=cid:20ce8b39,vid:dxMtSstlevU,st:0

Der hvor de virkelig har styr på tingene - CIVC i Epernay.

- www.champagne.fr

Online teaching på 7 sprog hos CIVC

- https://www.champagne.fr/en/the-champagne-magazine/champagne-mooc-become-champagne-expert

Kursus i ”Principles in sparkling winemaking” på Plumpton College i England

- https://www.plumpton.ac.uk/courses/wineskills-principles-of-sparkling-winemaking-three-day-course-400/
- https://www.plumpton.ac.uk/courses/sparkling-wine-production-continued-professional-development/

Oversigt af samtlige internationale Piwi sorter

- https://piwi-international.org/en/ueber-piwi/piwi-grapes/?isprofi=1&limit=1000&shop=&layout=piwi&haendler=&lang=de&suchbegriff=&Zuechter=&Land=&Farbe=&Art=&trp-form-language=en

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REVIEW

A cool climate perspective on grapevine breeding: climate change and sustainability are driving forces for changing varieties in a traditional market

Reinhard Töpfer[1] · Oliver Trapp[1]

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Abstract
A multitude of diverse breeding goals need to be combined in a new cultivar, which always forces to compromise. The biggest challenge grapevine breeders face is the extraordinarily complex trait of wine quality, which is the all-pervasive and most debated characteristic. Since the 1920s, Germany runs continuous grapevine breeding programmes. This continuity was the key to success and lead to various new cultivars on the market, so called PIWIs. Initially, introduced pests and diseases such as phylloxera, powdery and downy mildew were the driving forces for breeding. However, preconceptions about the wine quality of new resistant selections impeded the market introduction. These preconceptions are still echoing today and may be the reason in large parts of the viticultural community for: (1) ignoring substantial breeding progress, and (2) sticking to successful markets of well-known varietal wines or blends (e.g. Chardonnay, Cabernet Sauvignon, Riesling). New is the need to improve viticulture´s sustainability and to adapt to changing environmental conditions. Climate change with its extreme weather will impose the need for a change in cultivars in many wine growing regions. Therefore, a paradigm shift is knocking on the door: new varieties (PIWIs) versus traditional varieties for climate adapted and sustainable viticulture. However, it will be slow process and viticulture is politically well advised to pave the way to variety innovation. In contrast to the widely available PIWIs, competitive cultivars created by means of new breeding technologies (NBT, e.g. through CRISPR/Cas) are still decades from introduction to the market.

The origins of grapevine breeding

Grapevine (*Vitis vinifera*) is the economically most important perennial fruit crop grown on 7,34 mil. ha (84,83 mil. t fresh grapes; OIV 2019) for wine grapes, table grapes, dry fruits, juice and other products made thereof. The cultivated *Vitis vinifera* ssp. *vinifera* and its wild relative *Vitis vinifera* ssp. *sylvestris* form the autochtonous species in Europe and the Near East, the Eurasian gene pool, largely endemic to the Mediterranean basin (Töpfer et al. 2011; Magris et al. 2021). The cultivated compartment of *Vitis vinifera* is highly susceptible to different pests and diseases, of which some were introduced into Europe (Feechan et al. 2013). Grapevine is propagated vegetatively and usually grown on rootstocks, that are tolerant to phylloxera, an insect pest introduced into Europe in 1863–1868 that almost destroyed European viticulture in the late nineteenth century (Galet 1977). Other serious pathogens were introduced from North America such as powdery mildew (PM, caused by *Erysiphe necator*) in 1845–1852 resulting in serious quality deficits, and downy mildew (DM, caused by *Plasmopara viticola*) in 1878 resulting in high yield losses (Galet 1977). Of minor importance in comparison to the mildews was the introduction of black rot (BR, *Guignardia bidwellii*) in 1885, which affects the grape yield (Galet 1977). All these pathogens dramatically changed viticulture and triggered the start of grapevine breeding activities in several countries.

From a breeding point of view, the grapevine turned out to be a recalcitrant crop with its juvenile phase of about 3 years until the first fruit set, a long breeding cycle of about 25 years (see Fig. 1), high heterozygosity and strong inbreeding depression, the requirement for biotic and abiotic resistances, the general viticultural properties, and finally its complex product quality traits, especially wine quality.

Communicated by Hermann Buerstmayr.

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[1] Julius Kühn-Institut, Federal Research Centre for Cultivated Plants, Institute for Grapevine Breeding Geilweilerhof, Siebeldingen, Germany

Piwi eller ej?

PIWI International

	RATING	WINERY	WINE	YEAR	COUNTRY	WEBSITE
TOP GOLD	98	Ing. Miroslav Volarik	Saphira	2021	Czech Republic	nove-lune.com
	97	Nove Lune	Cuvée	2022	Italy	weinhof-scharl.at
	96	Charakterweine Josef Scharl	Souvignier gris	2020	Austria	agroscope.admin.ch
	96	Agroscope	Divico	2021	Switzerland	weinbauernhof-diem.at
	96	Weinbauernhof Fam. Diem	Donauveltliner	2022	Austria	weinkonvent-duerrenzim-
	96	Weinkonvent Dürrenzimmern eG	Cabernet Blanc	2022	Germany	mern.de
	96	Ing. Miroslav Volarik	Saphira	2022	Czech Republic	vinarstvivolarik.cz
	96	Winzergenossenschaft Britzingen Markgräflerland eG	Souvignier Gris	2022	Germany	britzinger-wein.de
GOLD	95	Milan Vašíček	Donauriesling	2022	Czech Republic	vinovasicek.cz
	95	Ökologisches Weingut Rabenhof	Souvignier Gris	2022	Germany	rabenhof.de
	94	Bio-Weinbau Knechtle Glogger	Maréchal Foch	2021	Switzerland	biowein-knechtleglogger.ch
	94	Delinat GmbH	Belat, VB91-26-26	2021	Germany	delinat.com
	94	Steilwerk Rohracker / Weingärtnergenossenschaft Rohracker	Cuvée	2020	Germany	steilwerk.de
	94	Weingut Müller GbR	Cabertin	2020	Germany	weingut-m.de
	94	Weingut DER BAUER. Triesneckerhof	Gem. Satz aus PIWI	2022	Austria	derbauer.wine
	94	Weingut und Brennerei Andreas Dilger	Souvignier gris	2020	Germany	weingut-andreas-dilger.de
	94	Winnica Niemczańska	Solaris	2022	Poland	winnicaniemczanska.pl
	94	Weingut Georg Bielig	Souvignier gris	2020	Germany	weingut-bielig.de
	93	Weingut Schlossmühle Dr. Höfer	Regent	2018	Germany	weingut-hoefer.de
	93	La Colombette	Cabernet Blanc	2023	France	lacolombette.fr
	93	Piwi Kollektiv GmbH	PIWI Sorten		Germany	piwi-kollektiv.de
	93	Weingut Wohlgemuth-Schnürr	Prior	2022	Germany	wohlgemuth-schnuerr.de
	93	Weingut Schlossmühle Dr. Höfer	Regent	2014	Germany	weingut-hoefer.de
	93	La Colombette	Cuvée	2022	France	lacolombette.fr
	93	Sartori Organic Farm di Sartori Michele	Solaris	2022	Italy	www.sartoriorganicfarm.com
	93	Cantina di La-Vis e Valle di Cembra Sca	Cuvée	2022	Italy	la-vis.com
	93	Kollerhof am Eichberg	Donauriesling	2022	Austria	kollerhof.com
	93	Winzer Krems eG	Donauriesling	2022	Austria	winzerkrems.at
	93	LE CARLINE	Cuvée	2022	Italy	lecarline.com
	93	Weingut Hauer	Cabernet Blanc	2022	Germany	katharinenhof-hauer.de
	93	GrafenBERGERin	Cuvée	2022	Austria	grafenbergerin.at
	93	Ing. Miroslav Volarik	Solaris	2022	Czech Republic	vinarstvivolarik.cz
	93	Winnica Niemczańska	Cabernet Blanc	2021	Poland	winnicaniemczanska.pl
	93	Weingut Kuhnle	Muscaris	2022	Germany	weingut-kuhnle.de
	93	florem vitis	Souvegnier gris	2020	Italy	floremvitis.com
	93	VINSELEKT MICHLOVSKÝ a.s.	Rinot		Czech republic	michlovsky.com
	93	20ers Winzerei & Buschenschank	Muscaris		Austria	20ers.at
	93	Weinbau Zelglihof	Solaris	2022	Switzerland	zelglihof.ch
	93	Weingut Hauer	Cabernet Blanc	2022	Germany	katharinenhof-hauwe
	93	Weingut Honold	Muscaris	2018	Germany	weingut-honold.de
	93	Ökologisches Weingut Rabenhof	Monarsch		Germany	rabenhof.de/
	93	Ökologisches Weingut Rabenhof	Muscaris	2022	Germany	rabenhof.de/

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Les variétés résistantes au mildiou et à l'oïdium issues de la recherche française

Christophe Schneider et al., INRAE-US UMR1131, 68000 Colmar

https://techniloire.com/sites/default/files/varietes_resistantes_oringine_creation-compresse.pdf

Kan man smage forskel på flaskegæret og tryktankgæret mousserende vin?

Research Article

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(wileyonlinelibrary.com) DOI 10.1002/jsfa.9153

The role of production process and information on quality expectations and perceptions of sparkling wines

Riccardo Vecchio,[a] Maria T Lisanti,[a*] Francesco Caracciolo,[a] Luigi Cembalo,[a] Angelita Gambuti,[a] Luigi Moio,[a] Tiziana Siani,[a] Giuseppe Marotta,[b] Concetta Nazzaro[b] and Paola Piombino[a]

Abstract

BACKGROUND: This study, by combining sensory and experimental economics techniques, aims to analyse to what extent the production process, and the information about it, may affect consumer preferences. Sparkling wines produced by Champenoise and Charmat methods were the object of the study. A quantitative descriptive sensory analysis with a trained panel and non-hypothetical auctions combined with hedonic ratings involving young wine consumers (*N* = 100), under different information scenarios (*Blind*, *Info* and *Info Taste*), were performed.

RESULTS: The findings show that the production process impacts both the sensory profile of sparkling wines and consumer expectations. In particular, the hedonic ratings revealed that when tasting the products, both with no information on the production process (*Blind*) and with such information (*Info Taste*), the consumers preferred the Charmat wines. On the contrary, when detailed information on the production methods was given without tasting (*Info*), consumers liked the two Champenoise wines more.

CONCLUSION: It can be concluded that sensory and non-sensory attributes of sparkling wines affect consumers' preferences. Specifically, the study suggests that production process information strongly impacts liking expectations, while not affecting informed liking.

Keywords: sensory; hedonic ratings; experimental auctions; information; willingness-to-pay (WTP); sparkling wine

INTRODUCTION

The food quality perception process has been extensively analysed in the literature, and several theoretical approaches have been developed.[1–3] To summarize, the quality dimension can be defined as a product-specific evaluation that consumers assign based on the attributes of the product. Food attributes are generally divided into intrinsic (physical) and extrinsic product attributes.[4] Both intrinsic and extrinsic attributes may influence consumers' quality expectations and perceptions, and the resulting choice. While intrinsic attributes, such as sensory properties, are naturally associated with consumers' preferences,[5–7] several studies have demonstrated the impact of extrinsic food attributes on quality expectations and perceived hedonic valuation (for a complete review, see Piqueras-Fiszman and Spence[8]) as being important quality signals.[3] On the other hand, the same expectations play an important role in food-purchasing decisions as they can positively or negatively influence the quality perception of the product.[9] Expectations can originate from a wide variety of different extrinsic attributes, such as brand,[10] price,[11] health and nutritional values,[3,12] and information about production processes or origin.[13,14] Thus, the available information affecting expectations can have a relevant effect on consumer liking and acceptability of the product.[15] Providing information on the production process, on the origin, or on the ingredients of a food product is a way in which marketing managers attempt to provide consumers with evidence of desirable product characteristics.[16,17]

In recent years, many consumers have become more concerned about non-sensory factors, influencing their liking and choice of foods.[18] Thus, an increasing number of firms are focusing their marketing efforts in communicating what food contains, where it comes from, and how it is produced.[19–21] As for the latter aspect, information on the processes employed in food production is increasingly communicated and the consumers are more actively involved in searching for information on this specific aspect.[22–24] This study aims to analyse how and to what extent the production process, and the information given about it, may affect consumer

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ORIGINAL RESEARCH ARTICLE

Are the characteristics of sparkling wines obtained by the Traditional or Charmat methods quite different from each other?

Bruno Cisilotto*[1,2], Fernando Joel Scariot[1], Luisa Vivian Schwarz[1], Ronaldo Kauê Mattos Rocha[1], Ana Paula Longaray Delamare[1] and Sergio Echeverrigaray[1]

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ABSTRACT

In this study, we performed an analytical and sensorial comparison between sparkling wines produced by the Traditional and Charmat methods using the same base wine, yeast strain, inoculum, and aged on the lees during the same periods. The absence of evident differences in the results of the analyses of physicochemical and volatile compounds was confirmed by the sensory analysis. In general, during the tests, more evaluators could identify differences in the first stages in which sensory analyses were performed. As the ageing time on the lees increase, fewer evaluators could differentiate between the sparkling wines. It was observed that more than half of the evaluators could not differentiate the samples in all stages. Based on our data, we conclude that the method used for the second fermentation is not the determinant of the eventual differences currently associated with sparkling wine produced by the Traditional and Charmat methods.

KEYWORDS: volatile compounds; sensory analysis; triangle test; qualitative similarities

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Article

Evolution of Volatile Aroma Compounds and Amino Acids in Cabernet Gernischt Grape Berries (*Vitis vinifera* L.): Comparison of Different Training Systems for Mechanical Soil Burial

Kangqi Geng [1,†], Dongmei Li [2,†], Jing Zhang [2], Yanxia Zhang [1], Zhennan Zhan [1] and Zhenping Wang [1,2,*]

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† These authors contributed equally to this work.

Abstract: Soil burial is a survival strategy for grapevines that can safely overwinter in north-western regions of China. A suitable training system was beneficial for soil burial to provide winter protection. Moreover, the training system can also significantly affect fruit quality during the development of grape berries, such as primary and secondary metabolites. In this study, four-year-old Cabernet Gernischt grapevines were used as experimental material and exposed to four training systems, including the Ningxia traditional vertical trunk (control, CK); the gobelet (T1); single guyot (T2); slant trunk with vertical shoot positioning (STVSP) (T3). The results showed that total soluble solid total phenol content was 12.69%, 57% higher under T3 training systems than in the control, and T3 alleviated the canopy density, leading to improving the leaf photosynthetic efficiency gas chromatography-mass spectrometry (GC-MS) assay used to detect the aroma compounds. The results indicated that the T3 training system enhanced the accumulation of alcohols, carbonyl compounds, C6/C9 and esters, which account for the largest proportion of volatile compounds, and the qRT-PCR reveals that *VvEcar*, *Vvter*, *VvCCD1*, and *VvLis* were raised under T3 at the transcriptional level. Moreover, T3 contributes to most free amino acid synthesis. Additionally, the PCA reveals the correlation of free amino acids under four training systems, which reflected the mostly amino acid related to T3, and thus, we could speculate that T3 enhances the overall aroma. These results may lead to new strategies to select a new, short trunk training system to achieve mechanized buried soil, to prevent cold and produce high-quality wine in this area.

Keywords: Cabernet Gernischt; training systems; volatile aroma compounds; amino acids; gene expression

check for updates

Citation: Geng, K.; Li, D.; Zhang, J.; Zhang, Y.; Zhan, Z.; Wang, Z. Evolution of Volatile Aroma Compounds and Amino Acids in Cabernet Gernischt Grape Berries (*Vitis vinifera* L.): Comparison of Different Training Systems for Mechanical Soil Burial. *Foods* **2022**, *11*, 1568. https://doi.org/10.3390/foods11111568

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1. Introduction

Grape berry development and ripening are dynamic processes that involve a complex series of biochemical changes [1]. Aroma compounds are secondary metabolites that play a key role in grape quality for enological purposes. Terpenes, C_{13}-norisoprenoids, phenols, and non-terpenic alcohols are the most important aroma compounds in grapes, and can be found as free volatile or glycol-conjugated (bound) molecules [2]. Previous reports have shown that more than 900 kinds of volatile aroma substances were identified and isolated from grape wine, and furthermore, the complexity of wine aroma can also vary depending on many variables, such as the type of wine, grape variety, terroir, microbial starter, fermentation process, aging, and bottling [3]. Among them, the variety characteristic aroma plays a decisive role. The content of volatile aroma compounds changes during the process of grape berry ripening, for instance, varietal volatile compounds content reached a

Hvad ved vi egentligt om druemodning i Danmark og egnethed til mousserende vin?

Saranya Mira Messerschmidt
Zealand- Sjællands Erhversakademi
Procesteknolog 4. semester
rf22pt1c4-4c
10/01/24

DRUEMODNINGSSTUDIE

Eksamensopgave i procesteknologi

10. JANUAR 2024
SARANYA MIRA MESSERSCHMIDT

TABEL 3: Druemodning i Epernay 2015, Geilweilerhoff JKI 2021 og i Birkerød GHG 2023 (efter kuldestabilisering) vurderet med 3 ugers tidsforskydning.

						pH=2,90-3,15		TA beregnet		MA<TartA			vincalc beregnet		>20	>15	>35	>150	>1.22		
DRUEMOST MÅLINGER (SORT)	Lokation (Område)	År	Press	Most Prøve Uge	Dato	pH	TA g/L H2SO4	TA g/L TartA	MalicA g/L	TartA g/L	Sugar g/L (1)	Beregnet Brix% (1)	Beregnet Brix% (2)	Potential Alkohol %v/v (2)	MD1 Sugar/TA (H2SO4)	MD2 Brix/TA (TartA)	MD3 Brix/MA (Malic)	MD4 Brix*pH *pH	MD5 TartA/MA	VELEGNET TIL SORTSPECIFIK MOUSSERENDE	KERNE FARVE
Pinot Meunier	Epernay	2015	S1	I	26.aug	2,90	10,80	16,5	10,2	8,2	133,2	12,7	14,6	7,9	12	9	14	123	0,80	nej	
				II	04.sep	2,97	7,90	12,1	7,0	7,0	167,1	15,7	18,0	9,9	21	15	26	158	1,00	ja *	
				III	15.sep	2,96	8,60	13,2	7,2	9,4	182,9	17,1	19,6	10,9	21	15	27	172	1,31	ja	
	Epernay	2015	S2	I	26.aug	2,92	10,40	15,9	9,7	8,0	133,5	12,7	14,6	7,9	13	9	15	124	0,82	nej	
				II	04.sep	3,08	7,40	11,3	6,7	7,1	171,9	16,1	18,5	10,2	23	16	28	175	1,06	ja	
				III	15.sep	3,05	7,80	11,9	6,8	8,9	180,1	16,8	19,3	10,7	23	16	28	180	1,31	ja	
Chardonnay	Epernay	2015	S1	I	29.aug	2,78	9,90	15,1	8,3	8,2	134,5	12,8	14,8	8,0	14	10	18	114	0,99	nej	
				II	07.sep	2,78	9,30	14,2	7,0	8,6	157,8	14,9	17,1	9,4	17	12	24	132	1,23	nej	
				III	17.sep	2,81	7,40	11,3	5,2	8,6	167,8	15,8	18,1	10,0	23	16	35	143	1,65	ja	
	Epernay	2015	S2	I	29.aug	2,80	9,30	14,2	7,7	8,1	135,0	12,8	14,8	8,0	15	10	19	116	1,05	nej	
				II	07.sep	2,80	8,40	12,9	6,7	8,1	157,3	14,8	17,1	9,4	19	13	26	134	1,21	nej	
				III	17.sep	2,88	6,90	10,6	5,0	8,4	170,6	16,0	18,3	10,1	25	17	37	152	1,68	ja	
ingen målinger	Epernay	2016	S1	I	29.aug																
				II/III	13.sep	2,84	9,90	15,1	9,2	9,4	154,8	14,6	16,6	9,1	16	11	18	134	1,02	nej	
				iV/V	26.sep	2,93	6,80	10,4	3,9	7,9	186,8	17,4	19,9	11,1	28	19	51	171	2,03	ja	
								Målt TA				Målt Oe	Brix%								
Calardis Blanc	Geilweilerhoff	2021		I	31.aug	2,74		26,2	18,4	13,2		33,1	8,3	4,3		3	5	62	0,72	nej	
				II	07.sep	2,95		19,4	13,1	10,1		43,1	10,7	5,7		6	8	93	0,77	nej	
				III	14.sep	3,06		14,7	8,7	9,2		52,6	13,0	7,0		9	15	122	1,06	nej	
				IV	21.sep	3,16		11,9	7,0	7,2		60,7	14,9	8,1		13	21	149	1,03	nej	
				V	28.sep	3,20		11,0	6,0	7,3		68,3	16,7	9,1		15	28	171	1,22	ja * **	
Calardis Musque	Geilweilerhoff	2021		I	31.aug	3,11		13,2	9,8	9,0		67,7	16,5	9,0		13	17	160	0,92	nej	
				II	07.sep	3,19		11,4	6,1	8,6		80,8	19,5	10,9		17	32	198	1,41	ja **	
				III	14.sep	3,27		10,0	4,7	8,6		87,8	21,1	11,8		21	45	225	1,83	nej	
				IV	21.sep	3,34		7,8	2,0	7,4		91,5	21,9	12,4		28	110	244	3,70	nej	
ingen målinger				V	28.sep																
						M-T (frosset prøve)		Oenofoss		TA kuldestabiliseret			Oenofoss-2 målinger			>25	>50		>1.0		
Pinot Noir	Birkerød	2023		III	14.sep	3,06		6,65	3,37	5,78			12,5	6,7		19	37	117	1,72	nej	
				IV	21.sep	3,08		5,87	3,10	5,14			13,3	7,1		23	43	126	1,66	nej	x
vinskimmel				V	28.sep	3,16		4,60	1,07	5,27			12,8	6,9		28	120	128	4,93	uvist	xx(x)
vinskimmel				VI	05.okt	3,19		4,60	1,24	4,59			12,6	6,7		27	101	128	3,70	uvist	xx(x)
vinskimmel				VII	19.okt	2,90		7,63	4,30	5,10			10,1	5,3		13	24	85	1,19	uvist	?
Chardonnay	Birkerød	2023		III	14.sep	2,96		8,53	4,66	6,75			17,4	9,6		20	37	153	1,45	ja *	
				IV	21.sep	3,15		6,49	3,15	6,46			21,0	11,8		32	67	208	2,05	nej	xx
				V	28.sep	3,01		6,45	3,30	6,47			21,4	12,0		33	65	194	1,96	nej	xxx
høstet 30.sep				VI	05.okt																
høstet 30.sep				VII	19.okt																
Felicia	Birkerød	2023		V	28.sep	2,98		8,72	5,68	5,59			13,6	7,3		16	24	120	0,98	nej	x
				VI	05.okt	3,12		7,65	5,17	4,49			13,1	7,0		17	25	127	0,87	nej	xx
høstet 7. okt				VII	19.okt	3,16		6,36	4,64	4,63			16,5	9,0		26	35	164	1,00	ja * **	?
Calardis Blanc	Birkerød	2023		V	28.sep	2,62		10,07	5,31	7,35			16,7	9,1		17	31	115	1,38	nej	xx
				VI	05.okt	2,75		8,00	4,85	5,13			17,3	9,5		22	36	131	1,06	nej	xx(x)
høstet 19.okt				VII	19.okt	2,80		7,46	4,38	5,68			17,8	9,8		24	41	139	1,30	ja - sen moden *	xxx
Calardis Musque	Birkerød	2023		III	14.sep	3,00		8,08	5,21	5,48			15,6	8,5		19	30	140	1,05	nej	
				IV	21.sep	3,10		6,62	3,89	5,07			15,8	8,6		24	41	152	1,30	nej	xx
				V	28.sep	3,24		5,40	3,61	5,33			18,4	10,2		34	51	193	1,48	nej **)	xxx
høstet 30.sep				VI	05.okt																
høstet 30.sep				Vii	19.okt																
Sauvignac	Birkerød	2023		V	28.sep	2,50		14,31	8,78	8,30			15,7	8,5		11	18	98	0,95	nej	x
				VI	05.okt	2,68		12,16	7,99	7,64			17,1	9,4		14	21	123	0,96	nej	x
høstet 19. okt				VII	19.okt	2,70		11,88	7,24	8,17			18,5	10,2		16	26	135	1,13	ja	xx
Riesel	Birkerød	2023		V	28.sep	2,92		8,31	4,57	6,62			16,8	9,2		20	37	143	1,45	nej	
				VI	05.okt	3,17		5,45	2,21	5,89			17,2	9,4		32	78	173	2,67	nej	
				VII	19.okt	3,00		7,24	4,18	6,37			19,3	10,7		27	46	174	1,52	ja	
Zarlas Perle	Birkerød	2023		V	28.sep	2,93		8,30	4,00	7,18			16,5	9,0		20	41	142	1,80	nej	xx(x)
				VI	05.okt	2,95		6,37	2,69	5,57			14,9	8,1		23	55	130	2,07	nej	xx(x)
				VII	19.okt	2,91		7,16	3,03	7,07			18,1	10,0		25	60	153	2,33	ja	xxx
Souvignier Gris	Birkerød	2023		V	28.sep																
				VI	05.okt	2,83		5,45	7,32	7,76			14,0	7,5		26	19	112	1,06	nej	x
				VII	19.okt	2,83		7,24	6,34	7,45			15,1	8,2		21	24	121	1,18	nej	xx
Orion	Birkerød	2023		V	28.sep	2,95		9,98	6,69	5,45			12,9	6,9		13	19	112	0,81	nej	x
				VI	05.okt	3,06		6,65	4,27	4,76			15,2	8,3		23	36	142	1,11	nej	x(x)
				VII	19.okt	3,05		8,05	5,51	4,87			13,2	7,1		16	24	123	0,88	nej	xx
Phoenix	Birkerød	2023		V	28.sep	3,02		7,02	4,66	4,72			15,7	8,5		22	34	143	1,01	nej	(x)
				VI	05.okt	3,06		7,02	4,27	5,27			15,0	8,1		21	35	141	1,23	nej	x
				VII	19.okt	2,99		5,72	2,12	6,41			15,6	8,5		27	73	139	3,02	nej	xx
Solaris	Birkerød	2023		III	14.sep	2,79		9,52	5,26	8,11			18,9	10,5		20	36	147	1,54	ja	
				IV	21.sep	3,02		7,23	3,46	6,70			18,6	10,3		26	54	169	1,94	ja	x
				V	28.sep	2,98		8,72	4,31	8,21			23,8	13,1		27	55	211	1,90	nej	x(x)
høstet 30.sep				VI	05.okt	2,99		6,89	3,05	7,07			22,2	12,5		32	73	199	2,32	nej	xx
høstet 30.sep				VII	19.okt	2,94		6,16	2,74	6,14			22,6	12,8		37	83	195	2,24	nej	xxx
Bolero	Birkerød	2023		V	28.sep	3,27		5,05	2,03	5,07			11,8	6,3		23	58	126	2,50	nej	x
vinskimmel				VI	05.okt	3,32		4,81	1,01	4,70			11,1	5,9		23	110	123	4,65	nej	xx
vinskimmel				VII	19.okt	2,85		10,01	5,51	6,98			14,1	7,6		14	26	115	1,27	nej	xxx
Johanitter	Birkerø	2023		V	28.sep	2,85		12,33	6,77	8,95			16,9	9,3		14	25	137	1,32	nej	(x)
				VI	05.okt	3,03		10,26	6,26	6,94			16,5	9,0		16	26	151	1,11	nej	x(x)
				VII	19.okt	2,88		10,39	6,13	7,35			16,6	9,1		16	27	138	1,20	nej	xx
Muscaris	Birkerød	2023		V	28.sep	2,80		14,01	8,50	8,05			12,7	6,8		9	15	100	0,95	nej	x
				VI	05.okt	3,07		9,17	5,90	5,61			12,0	6,4		13	20	113	0,95	nrj	x
				VII	19.okt	2,84		9,50	6,25	5,16			10,3	5,4		11	16	83	0,83	nej	xx
Bianca	Birkerød	2023		V	28.sep	2,92		10,75	6,87	6,26			14,7	8,0		14	21	125	0,91	nej	x
				VI	05.okt	3,01		9,27	6,07	4,76			13,0	7,0		14	21	118	0,78	nej	x
				VII	19.okt	3,04		8,37	6,15	4,94			17,6	9,7		21	29	163	0,80	ja *	xx
Pinot Gris	Birkerød	2023		V	28.sep	3,11		5,45	2,85	5,30			16,9	9,3		31	59	163	1,86	nej	xx
				VI	05.okt	3,21		4,98	2,10	4,80			16,2	8,8		32	77	167	2,29	nej	xx
				VII	19.okt	3,18		6,71	3,83	5,00			16,9	9,3		25	44	171	1,31	nej	xx
Auxerroir	Birkerød	2023		V	28.sep	2,95		8,56	5,12	6,09			15,1	8,2		18	30	132	1,19	nej	x
				VI	05.okt	3,23		7,11	4,39	5,69			17,9	9,9		25	41	186	1,30	ja *	xx
				VII	19.okt	3,13		6,89	4,67	5,50			17,9	9,9		26	38	175	1,18	ja *	xxx
Bacchus	Birkerød	2023		V	28.sep	3,03		8,68	4,81	6,45			14,3	7,7		16	30	131	1,34	nej	x
vinskimmel				VI	05.okt	3,37		6,09	2,79	5,27			14,4	7,8		24	52	164	1,89	nej	xx
vinskimmel				VII	19.okt	3,09		6,78	4,23	5,21			14,3	7,7		21	34	137	1,23	nej	xx
Triomphe d'Alsace	Birkerød	2023		V	28.sep	3,00		9,73	5,38	7,51			17,0	9,3		18	32	153	1,40	nej	xx
				VI	05.okt	3,25		7,10	3,51	5,09			15,7	8,5		22	45	166	1,45	nej	xxx
				VII	19.okt	3,27		7,16	5,33	5,13			18,6	10,3		26	35	199	0,96	ja	xxx
Cabaret Noir	Birkerød	2023		V	28.sep	3,04		8,30	5,04	6,53			18,5	10,2		22	37	171	1,30	ja	xx
Drosophila susuki?				VI	05.okt	3,32		6,22	3,79	4,53			15,4	8,4		25	41	169	1,20	nej	xxx
Drosophila susuki?				VII	19.okt	3,35		7,86	5,68	4,18			15,9	8,7		20	28	178	0,74	nej	xxx
Pinot Noir Precose	Birkerød	2023		V	28.sep	3,34		8,14	5,79	5,31			13,9			17	24	155	0,92	nej	x
vinskimmel				VI	05.okt	3,80		7,20	5,06	3,50			11,0			15	22	159	0,69	nej	xx
vinskimmil				VII	19.okt																
Villaris	Birkerød	2024		V	28.sep																
				VI	05.okt																
				VII	19.okt																
Voltis/Floreal	B irkerød	2025		pH>3,15 for høj				TA som TartA = 1,53*TA som H2S04				<9,5% for lav alc%v		Beregnet alk.%vol		>11% for høj alc%v			TartA>MA ønsket	*) Chaptaliseres	**) Tilsættes vinsyre

GHG Druesorter undersøgt i 2023 for modning og sort-egnethed til mousserende vin, hvidvin, rødvin og hedvin

Nr..	Druesort	Res.	Optimal høstdato	Mousse vin	Hvidvin	Rosevin/ rødvin	Hedvin/ desseretvin
1	Auxerroir		5-19.okt	ja	ja	nej	nej
2	Riesel	Piwi	>19.okr	jo	jo	nej	nej
3	Zarlas Perle	Piwi	>19.okt	ja	Ja	nej	nej
4	Bianca	Piwi	>19. okt	ja	ja	nej	nej
5	Villaris	Piwi	>12.okt ??	ja	ja	nej	nej
6	Felicia	Piwi	>19.okt	Ja	ja	nej	nej
7	Sauvignac	Piwi	12-19.okt	Ja	Ja -høj syre	nej	nej
8	Calardis Blanc	Piwi	12-19.okt	Ja	ja	nej	nej
9	Pinot Gris		>19.okt	måske	Ja –men lav alkohol.	nej	nej
10	Triomphe d'Alsace	Piwi	>19.okt	nej	nej	Ja – ujævn modning	nej
11	Cabaret Noir	Piwi	>20.sept	nej	nej	Ja – Suzukii?	Nej
12	Phoenix	Piwi	>26.okt	nej	chaptasliser		nej
13	Orion	Piwi	>26.okt	nej	chaptaliser		nej
14	Pinot Noir Precoce		Svampe-angrebet	nej – assemblage	nej	Ja – men sen moden	nej
15	Pinot Noir		Svampe-angrebet	nej - umoden	nej	Ja – men sen moden	nej
16	Souvignier Gris	Piwi	>26.okt	nej - umoden	chaptaliser	nej	nej
17	Muscaris	Piwi	>26.okt	nej -umoden	chaptaliser	nej	Nej
18	Johanitter	Piwi	>26.okt	nej - umoden	chaptaliser	nej	Nej
19	Bacchus		>19.okt	nej - umoden		Nej	Nej
20	Bolero	Piwi	>19.okt	nej - umoden		ja	Nej
21	Calardis Musque	Piwi	20-27.sep	nej - overmodner	muscatsmag	nej	Ja muligvis
22	Chardonnay		13-27. sep	meget tidlig assembage	Ja	nej	ja
23	Solaris	Piwi	13-27. sep	meget tidlig assembage	nej for høj alkohol	nej	Ja velegnet
24	Kerner		Vinskimmel	udgået 2023	Udgået 2023	Udgået 2023	Udgået 2023
25	Voltis	ResDur	Ukendt				
26	Floreal	ResDur	Ukendt				
27	Chaselas		Ukendt				
28	Artaban	ResDur	Ukendt				
29	Coliris	ResDur	Ukendt			potentiel	
30	Sauvignon Soyhières	Piwi – (Tved)	2023 Efter Solaris	måske	måske	nej	Nej
31	Pinot Blanc		Ukendt	Ja med Nr. 1			
32	Castel		Ukendt			ja	

*) Nummer er efter rækkefølge af egnethed til Mousserende vin som enkeltsort i

https://vinosigns.dk/wp-content/uploads/2024/02/Druemodningsstudie-2023-Saranya-Ver-3.3-FINALPRINT.pdf

Druemodning i Cold Climate zonen.

Understanding the Ripening Chemistry of Cold-Hardy Wine Grapes to Predict Optimal Harvest Time

Luke Haggerty, University of Minnesota

The chemical composition of *Vitis vinifera* cultivars has been extensively researched, but little is known of the chemical composition of cold-hardy cultivars. We monitored fruit composition in 11 cultivars to determine how heat unit accumulations affected changes in fruit chemistry during the 2010 and 2011 growing seasons.

Tackling the intricate question of when to harvest can be difficult, and the chemical composition of grape berries has generally been accepted as the primary factor determining harvest time. Most growers and winemakers use soluble solids (mainly sugar) content or pH as harvest indicators and others may rely simply on taste. Growers want to capture the optimal balance between sugars, acids, and flavor that will contribute to sensory quality, stability, and alcohol potential of wine. The chemical composition of grapes continuously changes as the berry develops from fruit set to harvest. The grape ripening process after veraison includes a decrease in organic acids and an increase in sugars, berry weight, and pH. Developing a dynamic profile of the ripening process by tracking these changes will guide harvest decisions, leading to optimal grape maturity and improved wine quality.

Acids and sugars. Important indicators of grape maturity are titratable acidity (TA), pH, and soluble solids (°Brix), which measure the organic acid and sugar content. The most abundant organic acids in grapes are tartaric and malic acids. High amounts of malic acid can lead to undesirable effects on TA, pH, and wine sensory quality. Fortunately, malic acid concentrations decline after veraison, which contributes to the desired decline of TA. Tartaric acid is generally the most abundant organic acid and does not typically decrease after veraison. Glucose and fructose make up 99% of the total soluble solids and concentrations increase from veraison through maturity. Soluble solids are measured using a refractometer and expressed in °Brix and reflect the relative "sugar weight" of a juice sample (1.0 degree Brix is denoted as 1.0% sugar by weight). Measuring TA, pH and soluble solids is vital for determining optimal grape harvest times.

Research methods. Our objective was to identify and quantify organic acids and sugar composition of fruit from wine grape cultivars throughout fruit maturation. Grape berry samples of eleven wine grape cultivars (Table 1) were harvested every 8 to 10 days from early August to mid October during the 2010 and 2011 growing seasons at the University of Minnesota Horticultural Research Center in Chaska, MN. Samples of 40 berries at each harvest date were divided into 4 replicates of 10 berries that were weighed and juiced. Juice samples were measured for soluble solids, TA and pH. Analysis of variance and Least Significant Difference (LSD) were used as statistical analysis procedures to determine when harvest date no longer had a significant effect on grape maturity indicated by changes in °Brix, TA, and pH.

photo: David L. Hansen, University of Minnesota
Vignoble Le Mernois Vineyard and Winery

Results. As grape berries near maturity, the accumulation of soluble solids and degradation of organic acids begins to slow down and concentrations become nearly stable. When TA and °Brix plateau, the berry has reached the range of peak maturity. By expressing the harvest date in terms of accumulated heat units expressed as growing degree days (GDD), we are able to compare soluble solids, TA, and pH data from years that had quite different weather conditions. For example, 2010 was cool and wet compared to the hot and dry growing season of 2011. When comparing the two years of data to GDD, they showed nearly identical trends, supporting the use of GDD to track these measurable components (Fig 1). In both 2010 and 2011, TA and °Brix leveled off at approximately 2555 GDD, which was on Sept. 8th in 2010, and Aug. 29th in 2011.

Observations. Concentrations of organic acids, sugars, and berry weight were measured to predict peak maturity. By applying this technique to the grape cultivars in this study, we were able to make several notable observations:

- Peak maturity range occurred later than the historical harvest time (in terms of GDD accumulation) in most locations.
- In this study, *Vitis vinifera* cultivars matured later with respect to soluble solids, °Brix and pH.

Viticulture, enology and marketing for cold-hardy grapes

Fruit Ripening Profiles of Cold Climate Wine Grape Cultivars

University of Minnesota Horticultural Research Center
Chaska, MN

Teh SL, Haggerty LL, Hegeman AD and Luby JJ
Department of Horticultural Science, University of Minnesota

Background and Rationale:
The physical and chemical composition of wine grapes at harvest is a key factor that determines the fruit quality characteristics, and ultimately, the quality of the wine produced. As berries ripen, their chemical composition changes with regards to sugars, organic acids, phenolics, and other compounds. While these ripening profiles have been well characterized for *Vitis vinifera* cultivars, little is known about the changes of chemical composition in cold climate wine grape cultivars. Therefore, knowledge of the developmental profiles of these compounds is important for determining optimal harvest times to make quality wines.

Experimental Design:
We tracked the common field indicators used by viticulturists and winemakers to predict grape maturity throughout the growing season. Along with the field indicators, we performed chemical analyses of sugars and organic acids to describe seasonal concentration changes for the predominant sugars and acids found in grape juice.

Methods:
Berry sampling was carried out on 11 wine grape cultivars, which included seven cold climate and four *V. vinifera* cultivars. Four replicates of 10 berries per cultivar were sampled approximately every 10 days from August to October during the growing seasons of years 2010, 2011, 2012, and 2013. Harvest dates were converted to Growing Degree Days (GDD) (°C) accumulated since April 1 of the year, using 10 °C as the base temperature.

Cold climate wine grape cultivars	*V. vinifera cultivars*
Frontenac	Chardonnay
Frontenac gris	
Marquette	Merlot
La Crescent	
St. Croix	Pinot Noir
St. Pepin	Riesling
Marechal Foch	

Berries were juiced with a hand juicer. Grape juice was measured for soluble solids (expressed in °Brix), titratable acidity (TA), and pH using a refractometer, a titrator, and a pH meter, respectively. Profiles for sugar and organic acids were measured separately by liquid chromatography-mass spectrometry (LC-MS) using a Waters BEH Amide column (2.1 × 100 mm, 1.7 µm).

Ripening Profile of Grape Berry Acids and Sugars in University of Minnesota Wine Grape Cultivars, Select *Vitis vinifera*, and Other Hybrid Cultivars

A THESIS SUBMITTED TO THE FACULTY OF

UNIVERSITY OF MINNESOTA

BY

Luke LeMay Haggerty

IN PARTIAL FULFILLMENT OF THE REQUIRMENTS

FOR THE DEGREE OF

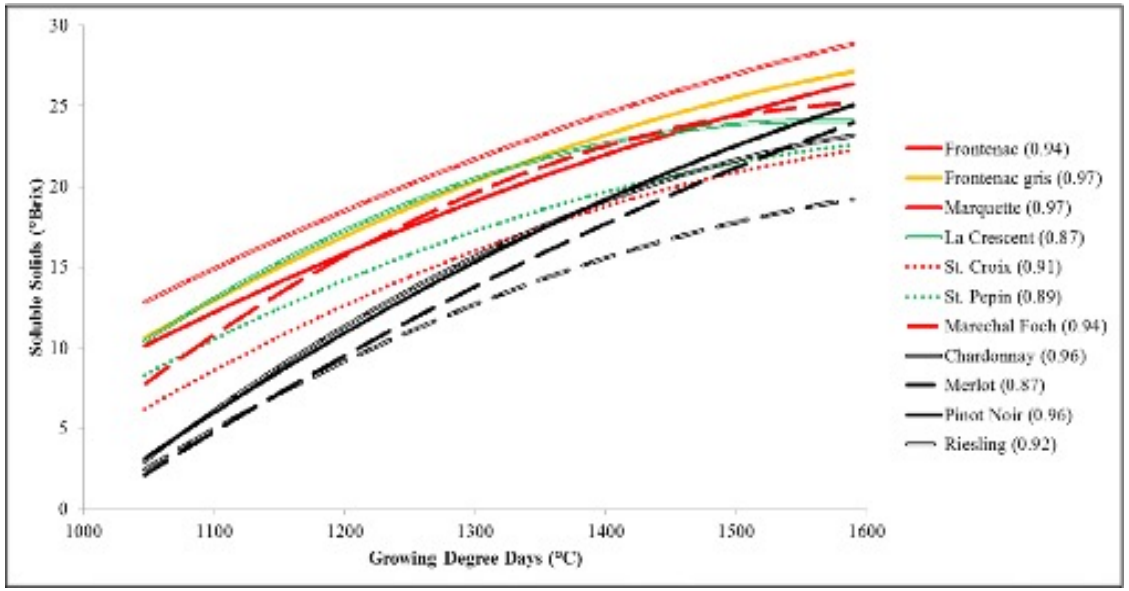
MASTER OF SCIENCE

James J. Luby, Co-advisor

Adrian D. Hegeman, Co-adviser

August 2013

Haggerty's målinger af graddage udviklingen for Brix, TA, samt MA og TartA fordelingen (MA=grøn, TartA=Violet)



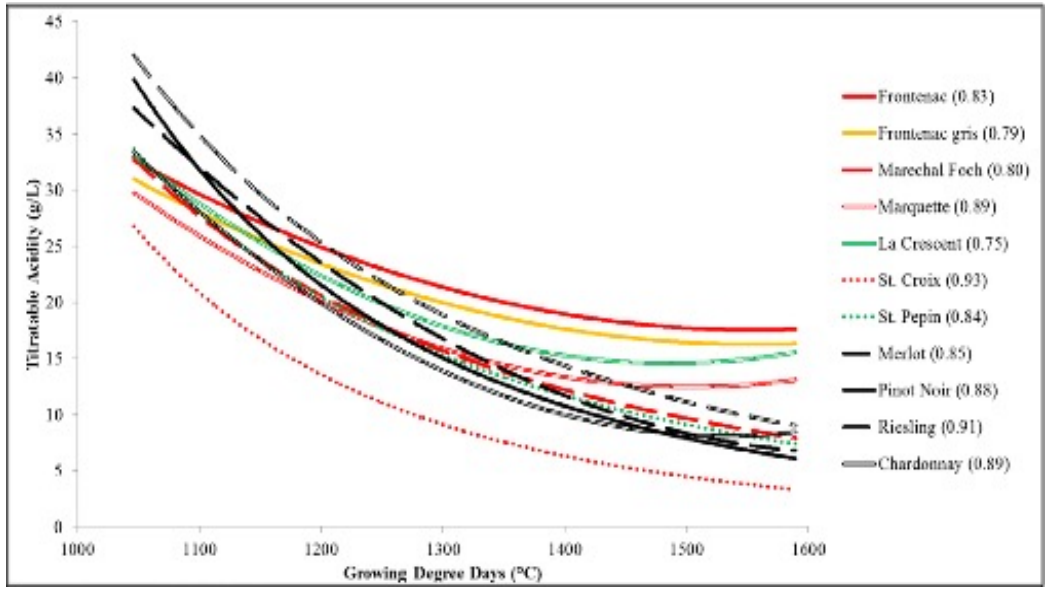
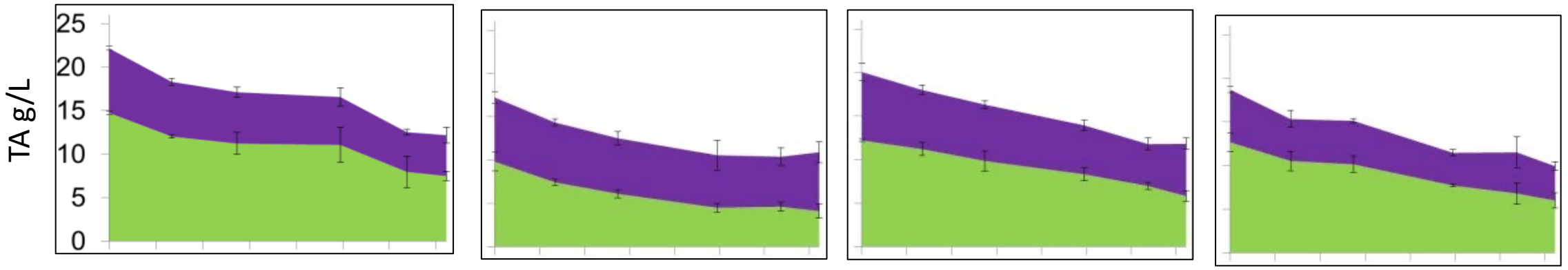
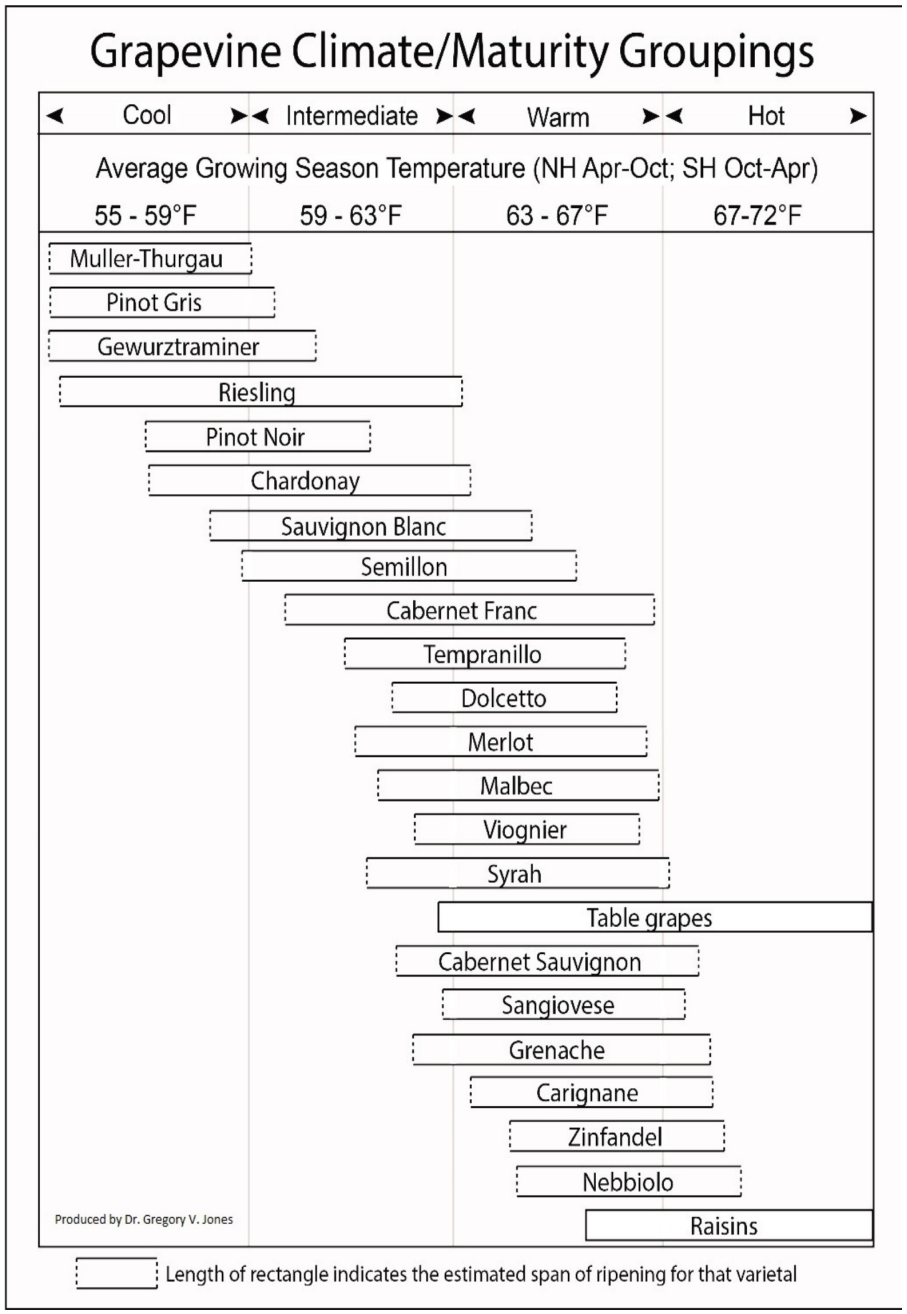
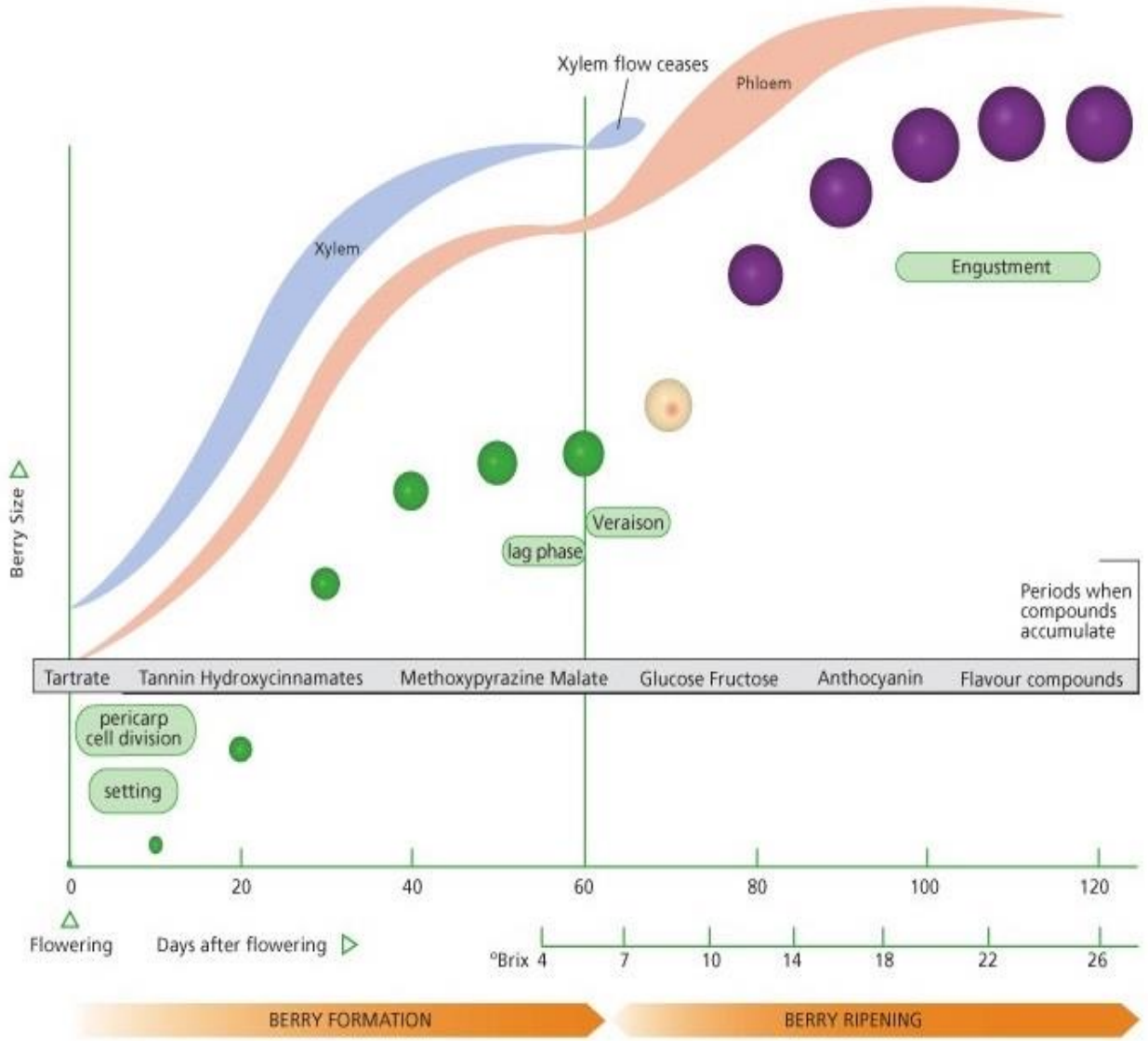


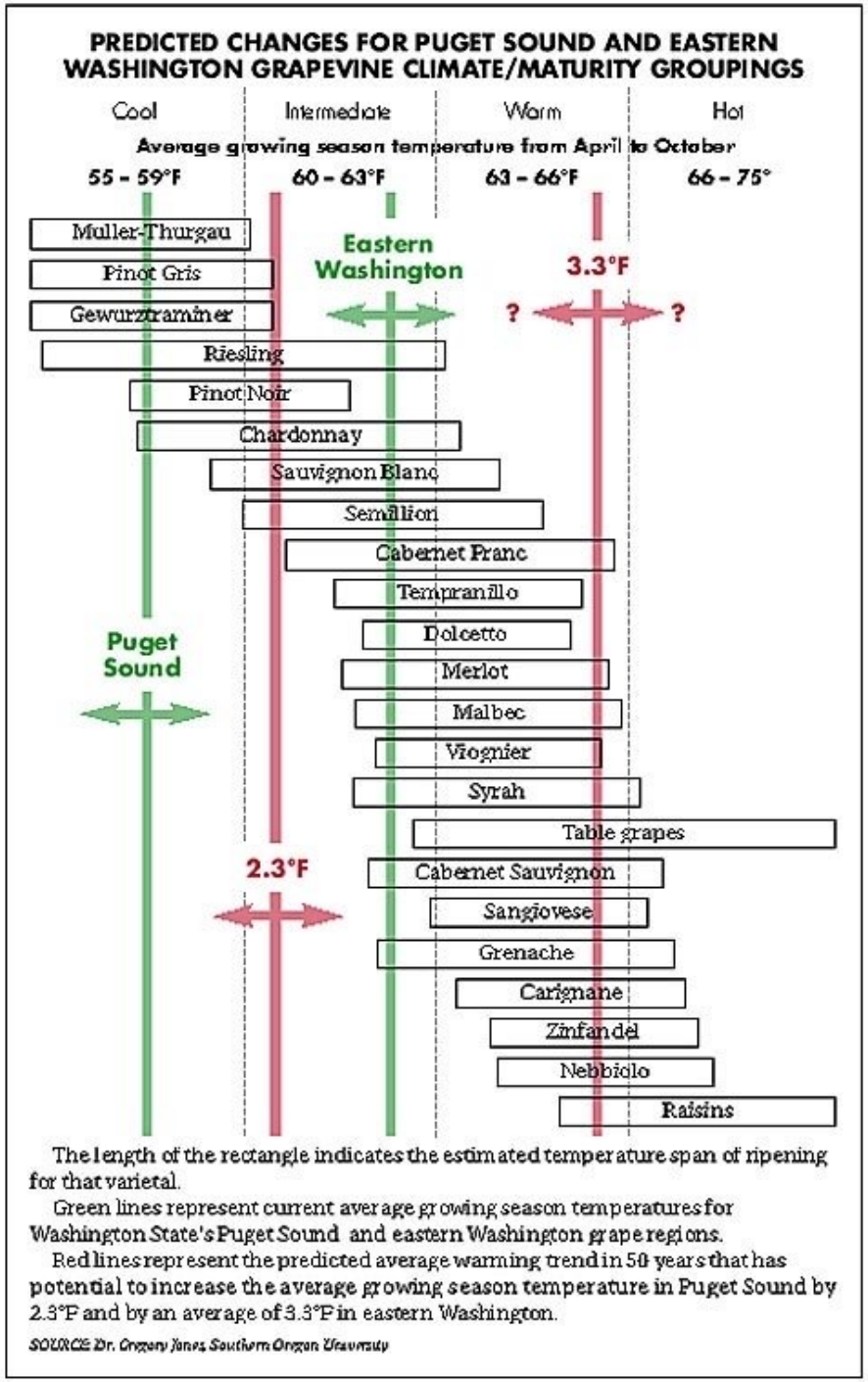
Figure 3: Variation in tartaric and malic acid proportions for four cold climate wine grape cultivars and four *V. vinifera* cultivars at six sampling dates during the berry ripening season in 2012.



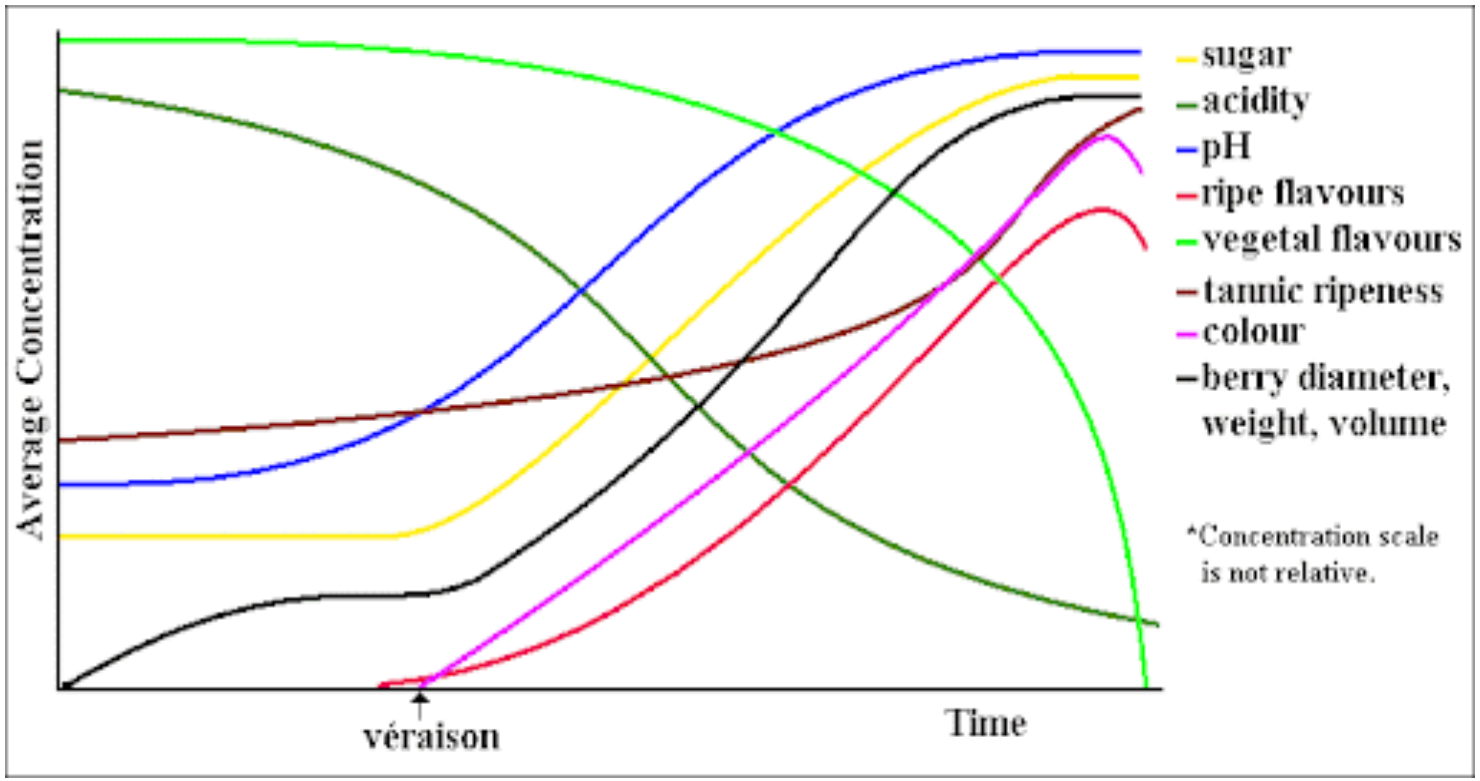
Druemodnings udvikling







Høsttidspunktets parametre



Bemærk især stigmingen i "ripe flavour" kurven – den brune kurve, samt udfladningen i "acidity" kurven – den mørkegrønne, og pH kurven – den blå kurve

Brug af elektroniske næser til vurdering af aromastoffer og druemodning

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Article

A Wireless and Portable Electronic Nose to Differentiate Musts of Different Ripeness Degree and Grape Varieties

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Abstract: Two novel applications using a portable and wireless sensor system (e-nose) for the wine producing industry—The recognition and classification of musts coming from different grape ripening times and from different grape varieties—Are reported in this paper. These applications are very interesting because a lot of varieties of grapes produce musts with low and similar aromatic intensities so they are very difficult to distinguish using a sensory panel. Therefore the system could be used to monitor the ripening evolution of the different types of grapes and to assess some useful characteristics, such as the identification of the grape variety origin and to prediction of the wine quality. Ripening grade of collected samples have been also evaluated by classical analytical techniques, measuring physicochemical parameters, such as, pH, Brix, Total Acidity (TA) and Probable Grade Alcoholic (PGA). The measurements were carried out for two different harvests, using different red (Barbera, Petit Verdot, Tempranillo, and Touriga) and white (Malvar, Malvasía, Chenin Blanc, and Sauvignon Blanc) grape musts coming from the experimental cellar of the IMIDRA at Madrid. Principal Component Analysis (PCA) and Probabilistic Neural Networks (PNN) have been used to analyse the obtained data by e-nose. In addition, and the Canonical Correlation Analysis (CCA) method has been carried out to correlate the results obtained by both technologies.

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Quantification of Wine Mixtures with an Electronic Nose and a Human Panel

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In this work, an electronic nose and a human panel were used for the quantification of wines formed by binary mixtures of four white grape varieties and two varieties of red wines at different percentages (from 0 to 100% in 10% steps for the electronic nose and from 0 to 100% in 25% steps for the human panel). The wines were prepared using the traditional method with commercial yeasts. Both techniques were able to quantify the mixtures tested, but it is important to note that the technology of the electronic nose is faster, simpler, and more objective than the human panel. In addition, better results of quantification were also obtained using the electronic nose.

Keywords: electronic nose, aroma quantification, gas sensor, wine mixtures, human panel

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INTRODUCTION

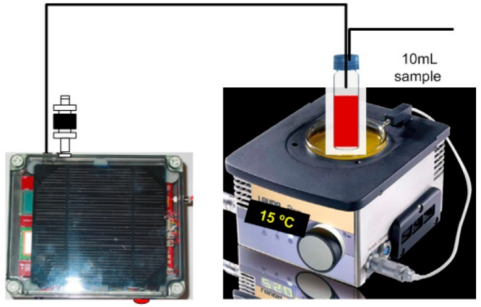
Nowadays, more information is required on the food products that the citizen consumes and even more on those with high added value, such as wine. The labeling of wine products should mention certain characteristics of the product, such as the alcoholic strength and the presence of sulfites. In addition, there are specific provisions governing the labeling of the various wine products and containing mandatory and optional indications for the labeling of each category of products.

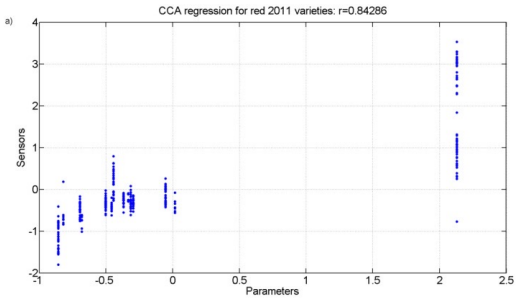
Therefore, there is a European Regulation, Regulation (EC) No 1493/1999, on the common organization of the market in wine. The rules of this regulation help consumers to better understand the specificities of wine products and guarantee to producers, the value of the quality of their products. The purpose of this regulation is to protect the interests of consumers and producers through the establishment of certain implementing provisions.

An important aspect would be to achieve an objective system that provides information on grape varieties introduced into a bottle, thereby defending criteria of authenticity and protection of quality of wines, at least for a given region, thus avoiding possible commercial wine fraud.

The wine control is carried out in cellars using traditional records referred to as "winery books." They must contain the land of origin of the grapes, the tanks where the wine have been fermented, and the subsequent trajectory of racking, mixing, clarification, rest in barrels, and bottling up, in summary the complete traceability cycle from source. In this way, one should be able to quantify the varieties that make up the wine that reach the consumer. It is important to develop an objective system that provides information on grape varieties introduced into a bottle, thereby defending criteria of authenticity and protection of quality of wines, at least for a given region, avoiding possible commercial wine fraud.

The tradition of wine blending began centuries ago. Blends are produced by mixing wine varieties in different proportions. Blending is mainly used to increase the complexity of the wine in order to enhance its organoleptic properties. Several studies have focused on the sensory and chemical





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